LABOUR FORCE, NATIONAL SAVINGS AND THE MANUFACTURING SECTOR PRODUCTIVITY IN NIGERIA

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Abstract

The study evaluated the role of sectoral labour force and the national savings on the manufacturing sector output in Nigeria from 1985 to 2019, a period of 35 years. Data was sourced from Central Bank of Nigeria (CBN) statistical bulletin various issues up until 2017, National Bureau of Statistics (NBS), and World Development Index (WDI). Data were analyzed using Vector Error Correction Model (VECM). The VECM result revealed that national savings and labour force have long run positive effect on the manufacturing sector output, while exchange rate and inflation have long-run negative effect on the manufacturing sector output. It could be deduced from this study that national savings, labour force in the industrial sector, inflation and exchange rate are very critical factors that determine the growth and survival of the manufacturing sector. Hence, it was recommended that the government look critically to the manufacturing sector and revamp the sector by making credit facility to the sector, and increase the use of domestic raw materials.

Key words:

Manufacturing output,
National savings,
inflation, labour force,
VECM.

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1. Introduction

A vibrant manufacturing sector has been acclaimed as a sure means of boosting economic growth and raising the standard of living. Nigeria has been regarded as the nation blessed with abundant resources; human and material. However, the underutilization of these potentials has amplified negative effects such as poverty, low level of standard of living etc. on the economy. In the modern world, the manufacturing sector is described as the basis on which the nation's economic efficiency is compared, ranked and determined (Danladi, Akomolafe, Babalola, and Oladipupo, 2015).

Manufacturing activities declined in Nigeria in the 1980s, as most companies were affected as a result of the global economic meltdown that further led to the closure of the industries as unfavourable conditions lingered, rapid industrial development is the key to the transition from static and subsistence economy to a dynamic and self-reliant one (Otalú and Adneru, 2015). Moreover, it is widely held that a rapid rate of industrial growth would produce the much needed less dependent economy and thus facilitate the attainment of national objectives of enhanced real per capita income, greater employment generation, increased local sourcing of raw materials and development of local industrial technology. Based on the foregoing, Nigeria, not only assigned a fundamental role to industrialization in the process of economic development, has also actively promoted it through a number of strategies ranging from primary exports, import substitution to export promotion in line with the prevailing development (Otalú and Adneru, 2015). Nigeria has mounted several other forms of policies to promote industrial output growth. Most of these policies are as a result of different prevailing economic periods/situations in the country and during these periods the patterns of industrial output growth have been uneven (Imide, 2019).

Utemadu (2002) stated that countries that are able to accumulate high level of capital tend to achieve fast rates of economic growth and development. Secondly, the quality of the government and its economic policies matter a lot. The radical theorist and early proponents of development economics were of the view that growth could be internalized. Developments in the world economies have shown that it is futile for economies to isolate themselves from rapidly integrating world (Essien & Bawa, 2007). Therefore, to finance adequate investment required for proper economic growth, every economy needs to generate sufficient savings or borrow from abroad. However, borrowing from abroad, according to Stephen and Obah (2017), is not proper strategy for economic growth, as it may not only have adverse effects on the balance of payment as the loans will have to be serviced in the future, but also carries

foreign exchange risks, national savings become indispensable for economic growth, because, they can provide the domestic resources that are needed to fund the investment effort of a country (Moni, 2015). Savings are considered as an indispensable tool for economic growth and development. They reflect in capital formation through increase capital stock and impact made on the capacity to generate more and higher income (Stephen and Obah, 2017),

It has been observed that for an economy to grow, the industrial sector and in particular, the manufacturing sub-sector must be the key driver of the economy (Ajudua and Ojima, 2016). Therefore, incompetent or poor industrial development policies have been recognized as major factors that adversely affect the well-being and socio-economic improvement of the people in developing countries and such policies are the major contributing factors to low value added and low economic growth (Anyanwu, 1993).

The manufacturing sector is thus widely considered to be the ideal industry to drive development in Africa as it offers prospects of a growing availability of manufactured products, increased employment, greater efficiency and improved balance of payments which will stimulate and promote productivity, improve living condition and serves as a catalyst for economic growth (Ajudua and Ojima, 2016). The background of this study has revealed the important role the manufacturing sector plays in the economic development of the country and the various challenges therein, hence this study examines the effect of the labour force and national income savings on the manufacturing sector growth in Nigeria from the periods of 1985 to 2019. The main purpose of this study is to evaluate the role of sectoral labour force and the national savings on the manufacturing sector output in Nigeria. This study assumes that the national savings are invested in the manufacturing sector and the labour force has the required qualification, at least a secondary school level.

To actually reveal the role of the national savings, exchange rate and inflation on the Nigeria manufacturing sector, the theoretical framework adopted for this study is the neoclassical growth model production function

$$Y = AF(K, L) \quad (1)$$

Where Y is Gross Domestic Product (GDP), K is the stock of capital, L is the amount of unskilled labour and A is exogenously determined level of technology. It is revealed that change in this exogenous variable, technology, will cause a shift in the production function.

Looking at the neoclassical production function, labour and capital are the major factors that determine increase in output. Hence, this study will introduce other

variables that have influence on the aggregate output of the manufacturing sector in Nigeria. These include; inflation rate, exchange rate, and national savings.

2. Review of Related Literature

Manufacturing sector accelerate productivity and innovation in which the spillover effects spread to other sectors of the economy. In other words, manufacturing sector is a growth-led sector as it leads to increase in economic growth via increasing returns, which is a macroeconomic phenomenon because it resulted from increasing returns to scale. Kaldor's law as cited in Ududechinyere, Eze, and Nweke, (2018) postulated that increase in the productivity of labour is based on the output of the manufacturing production.

The state of insecurity has discouraged farming in some key food production clusters across the country, particularly in the North-East region where Boko-haram continues to hit hard, and in the South due to the farmer-herdsmen conflict. Employment in industry (% of total employment) (ILO estimate) in Nigeria was 14.70 as of 2017. Its highest value over the past 26 years was 15.30 in 2014, while its lowest value was 8.50 in 2007 (ILO, 2017).

The total supply of available savings is simply the sum of domestic savings and foreign savings. However, domestic savings could be further broken into two components, which include government or public sector savings and private domestic savings. Amongst other things, savings serve as the main source of financing investment and related economic activities. Igbatayo & Agbada (2012) noted that higher level of national savings leads to higher investment and consequently higher output. This is so because the level of savings determines the magnitude of capital accumulation. On the other hand, the magnitude of total earnings depends on the level of total output, thus output also determines the level of savings (capital accumulation) and investments by households and business. Government savings originate from the surplus budgeting, but very few countries make part of their public sector savings from savings or profit of the government owned enterprises. There are also two aspects of private domestic savings. These include corporate savings and household savings. Again foreign savings also come into two basic forms such as foreign aid, and private foreign savings (Stephen and Obah, 2017).

A number of studies have been conducted so far to study the relationship between savings and economic growth in many developing countries, but most of them are connected to Latin American, sub-Saharan and East Asian countries, though there are relatively minimal study in Nigeria.

The reviewed literature show that there has not been literature relating labour force to the manufacturing sector output, though few of the studies were conducted on the national savings on the manufacturing sector in different methods, none has been able to relate labour force and national savings on the manufacturing sector of Nigeria and this is the gap filled in this research.

3. Methodology

3.1. Model Specification

The Solow growth model is symbolically represented as:

$$Q = (K, L) \quad (2)$$

Where Q is the national output, K represents capital resources employed and L for unit of labour employed in the production process. Since the focus of this paper is based on the influence of national savings, exchange rate and inflation, therefore national savings, exchange rate and inflation are factors that explain growth for this study. The output (growth) model specified for the purpose of this study considered a sub-sector of the Real Gross Domestic Product, Manufacturing sector is presented thus:

$$RMGDP_t = (LF_t, ANS_t, EXC_t, INF_t) \quad (3)$$

Where: $RMGDP_t$ = Real Manufacturing- GDP at time t , ANS_t = Adjusted Net Savings at time t , EXC_t = Exchange Rate at time t , INF_t = Inflation Rate at time t ,

Vector Error Correction Model

$$ECT_{t-1} = [Y_{t-1-n}X_{t-1} - E_m R_{t-1}], \quad (4)$$

Where:

Y_{t-1} = Dependent variable; $X_{t-1}, R_{t-1}, \dots, N_{t-1}$ are the Dependent variables

LONG-RUN COINTEGRATION MODEL

$$ECT_{t-1} = LMGDP_{t-1} - LANS_{t-1} - LF_{t-1} - EXC_{t-1} - INF_{t-1} \quad (5)$$

Where:

LMGDP: Log of Manufacturing sector in GDP

LANS= Log of Adjusted National Savings

LFIND= Labour Force (in rate)

EXC= Exchange Rate

INF= Inflation Rate

SHORT-RUN COINTEGRATION MODEL

$$\Delta Y_t = \sigma + \sum_{j=1}^{k-1} \Delta Y_{t-1} + \sum_{j=1}^{k-1} \eta_j \Delta X_{t-j} + \sum_{m=1}^{k-1} \Delta R_{t-m} + \lambda ECT_{t-1} + U_t \quad (6)$$

3.2. Data Sources and Measurements

The study used time series data for manufacturing sector contribution to the real GDP, national savings, exchange rate and inflation in Nigeria from 1985 to 2018. The data were obtained from the CBN statistical bulletin various issues up until 2017, National Bureau of Statistics (NBS) 2018 Statistical Bulletin and WDI (2019)

3.3. Estimation Technique

The first phase consists of pre-estimation evaluation, These are the preliminary evaluation of the data using the descriptive statistics method in order to help show, describe and summarize the data in a meaningful way and also to know if the data are normally distributed through their various averages and Jarque-Bera values (Gujarati & Dawn, 2009) cited in (Oseni and Adekunle, 2017).

The second step is the determination of the stability of the variables. For the purpose of this research Augmented Dickey-fuller (ADF) unit root tests was deployed. This test of the time series data is required because a non-stationary regressor invalidates many standard empirical results. The presence of a stochastic trend is determined by testing the presence of unit roots in time series data. (Oseni and Adekunle, 2017).

The next was the Autoregressive Distributive Lag analysis which was based on the order of integration of the variable series

The third phase is the post estimation. In order to confirm the robustness and validity of regression model, a post-estimation test was conducted, which was ARDL Bound Test to test for the existence of a long run relationship among the variables.

4. Empirical Result

4.1. Descriptive Statistic, Normality Test and Correlation Matrix

Table 1

Descriptive Statistics of the Data

	MGDP	LF	EXC	INF	ANS
Mean	2872.585	9.888765	95.60118	19.48382	16.17819
Median	1821.575	11.75400	94.42500	12.44000	16.49164
Maximum	6684.220	12.09300	306.4000	70.97000	43.92243
Minimum	1373.660	1.000000	0.740000	0.270000	0.079473

Std. Dev.	1831.159	4.180434	83.88924	18.94696	13.45586
Skewness	1.137729	-1.690101	0.907531	1.513074	0.404629
Kurtosis	2.719795	3.868995	3.368220	3.957543	2.097505
Jarque-Bera	7.446314	17.25629	4.859216	14.27215	2.081643
Probability	0.024158	0.000179	0.088071	0.000796	0.353164
Sum	97667.88	336.2180	3250.440	662.4500	550.0583
Sum Sq. Dev.	1.11E+08	576.7090	232234.3	11846.58	5974.988
Observations	34	34	34	34	34

Source: Researcher's E-view computation, 2020

Table 1 shows that the mean and median of all the variables lie within the maximum and minimum values. This indicates that the data are normally distributed. The variables manufacturing sector Gross Domestic Product (MGDP), Exchange rate (EXC), inflation (INF) and Adjusted Net Savings (ANS) are positively skewed, while Labour Force (LF) is negatively skewed. The Jarque-Bera statistics shows that the series, MGDP, LF, and INF are normally distributed since the p-values of the series are individually statistically significant at 5% level, while EXC is significant at 10%, ANS is not significant.

Table 2

Correlation Matrix of the Data Set

Correlation	LMGDP	LF	LANS	INF	EXC
LMGDP	1.000000				
LF	0.378115	1.000000			
LANS	-0.439261	0.431548	1.000000		
INF	-0.326549	-0.044117	0.118965	1.000000	
EXC	0.872636	0.324256	-0.438033	-0.507486	1.000000

Source: Researcher's E-view computation, 2020.

Correlation among the variables was estimated to detect whether the variables have high multicollinearity among themselves. Multicollinearity among variables only occur when the result of the correlation coefficient is above 0.95 (Iyoha, 2004). The results of the correlation analysis of Table 2 shows that the correlation coefficients among the variables, LMGDP, LF, LANS, INF, and EXC are below 0.95 which shows that there is no trace of multicollinearity among the independent variables.

Time Series Properties of the Variables

Table 3

Unit Root Test: Augmented Dickey-Fuller Test (ADF)

Variables	Level	1st Difference	2 nd Difference	Order of Integration
LANS	-	-5.227058*		I(1)
LF	-	-5.622718*		I(1)
EXC	-	-3.988753*		I(1)
INF	-	-5.235440*		I(1)
LMGDP		-3.23.316**		I(1)

Source: Researcher's E-view computation, 2020 Where *1%, **5%, and ***10%.

The study employed Augmented Dickey-Fuller to ascertain the order of integration of the variables. It was observed that all the variables are not stationary at level, but are stationary at first difference I(1). This satisfies the condition for applying Johansen procedure.

The next step is to choose the appropriate lag order. We have to bear in mind that our sample is quite small and a lag too big is not good, because it could restrain the degrees of freedom. We verify the existence and number of cointegrating relationship, by using trace test and max-eigenvalue test. By applying „lag length criteria” in Eviews we get the following results:

Table 4

VAR Lag Order Selection Criteria

Endogenous variables: MGDG LFIND EXC INF ANS

Exogenous variables: C

Sample: 1985 2018

Included observations: 32

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-779.7421	NA	1.37e+15	49.04638	49.27540	49.12230
1	-636.8583	232.1861	8.88e+11	41.67865	43.05277*	42.13413
2	-600.3919	47.86221*	4.90e+11*	40.96199*	43.48123	41.79705*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Various criteria diverge as to the lag order of the model. The researcher faces the challenge of a choice. In order to preserve the quality of our model and for consistency, since the Akaike information criterion (AIC) was used for the ADF, lag 2 for the initial VAR, model and this implies that lag 1 was used for the final VEC model. A second pre-condition for fitting a VEC model is that our series be cointegrated, at the chosen lag order. We verify the existence and number of cointegration relationship, by using trace test and max-eigenvalue test for the initial VAR model.

Table 5

Johanson Cointegration

Hypothesized	Eigenvalue	Trace	0.05	Prob.**	Max-Eigen	0.05	Prob.**
No. of CE(s)		Statistic	Critical Value		Statistic	Critical Value	
None *	0.824031	107.3141	69.81889	0.0000	53.86081	33.87687	0.0001
At most 1 *	0.522633	53.45329	47.85613	0.0136	22.92353	27.58434	0.1768
At most 2 *	0.405244	30.52976	29.79707	0.0411	16.10772	21.13162	0.2186
At most 3	0.369741	14.42203	15.49471	0.0721	14.31037	14.26460	0.0492
At most 4	0.003596	0.111663	3.841466	0.7383	0.111663	3.841466	0.7383

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue).

Table 5 revealed that trace statistics has three integrating equations, while max-Eigen statistic suggest only one co-integrating equations at 5% level of significance.

Table 6

Estimating and validating Vector Error Correction (VEC)

At this stage, we estimate our VEC model. We compute the vector error correction model with two lags, two CEs, no restriction imposed on coefficients and with intercept (no trend) in CEs and VAR. The results are as shown in table a

Vector Error Correction Estimates

Sample (adjusted): 1987 2018

Included observations: 32 after adjustments

Standard errors in () & t-statistics in []

Cointegrating Eq:	CointEq1					
LMGDP(-1)	1.000000					
LANS(-1)	0.056173 (0.07401) [-0.75895]					
INF(-1)	-0.017148 (0.00404) [-4.24398]					
EXC(-1)	-0.008549 (0.00164) [-5.21701]					
LF(-1)	0.051430 (0.02545) [2.02107]					
C	-7.070015					
Error Correction:	D(LMGDP)	D(LANS)	D(INF)	D(EXC)	D(LFIND)	
CointEq1	-0.019978 (0.03733) [-0.53515]	-0.968877 (0.74973) [-1.29230]	19.22467 (8.91553) [2.15631]	34.62368 (8.16841) [4.23873]	-0.590054 (1.01313) [-0.58241]	
D(LMGDP(-1))	0.567820 (0.17115) [3.31760]	1.373079 (3.43735) [0.39946]	-36.86500 (40.8759) [-0.90188]	-112.1722 (37.4505) [-2.99522]	1.084732 (4.64500) [0.23353]	
D(LANS(-1))	-0.005658 (0.00824) [-0.68635]	-0.620496 (0.16557) [-3.74771]	1.274787 (1.96887) [0.64747]	1.473141 (1.80388) [0.81665]	0.484615 (0.22374) [2.16601]	

D(INF(-1))	-0.000970 (0.00083) [-1.16426]	-0.033837 (0.01674) [-2.02145]	0.197346 (0.19905) [0.99143]	0.346247 (0.18237) [1.89859]	-0.057420 (0.02262) [-2.53849]
D(EXC(-1))	-0.000524 (0.00053) [-0.98940]	-0.007014 (0.01064) [-0.65940]	-0.145394 (0.12649) [-1.14946]	0.428279 (0.11589) [3.69558]	-0.006533 (0.01437) [-0.45448]
D(LF(-1))	-0.008269 (0.00617) [-1.33940]	0.057010 (0.12398) [0.45982]	1.861061 (1.47438) [1.26227]	-2.198896 (1.35082) [-1.62782]	0.074019 (0.16754) [0.44179]
C	0.028390 (0.01433) [1.98165]	-0.014471 (0.28772) [-0.05030]	1.560804 (3.42154) [0.45617]	10.95802 (3.13481) [3.49559]	0.321326 (0.38881) [0.82643]

LONG-RUN COINTEGRATION MODEL

$$ECT_{t-1} = LM GDP_{t-1} - LANS_{t-1} - LF_{t-1} - EXC_{t-1} - INF_{t-1}$$

$$ECT_{t-1} = 1.0000LM GDP_{t-1} + 0.56173LANS_{t-1} - 0.017148INF_{t-1} - 0.008549EXC_{t-1} + 0.051430LF_{t-1} - 7.070015$$

Table 6 revealed that INF_t and EXC_t have a long-run negative effect on the $MGDP$ while ANS_t and LF have long-run positive effect on the $MGDP$. This implies that 1% change in the ANS , INF and EXC respectively will bring about a 56.2%, 1.7% and 0.9% decrease on the $MGDP$ at the long-run, all things been equal.

SHORT-RUN COINTEGRATION MODEL

$$\Delta Y_t = \sigma + \sum_{j=1}^{k-1} \Delta Y_{t-j} + \sum_{j=1}^{k-1} \eta_j \Delta X_{t-j} + \sum_{m=1}^{k-1} \Delta R_{t-m} + \lambda ECT_{t-1} + U_t$$

$$\Delta LM GD_{t-1} =$$

$$-0.019978ECT_{t-1} + 0.567820LM GDP_{t-1} - 0.005658LANS_{t-1} - 0.000970INF_{t-1} - 0.000524EXC_{t-1} - 0.008269LF_{t-1} + 0.028390$$

The result shows that the previous year deviation from the long-run equilibrium is corrected at adjustment speed of 2% annually. A percentage change in the ANS is associated with a 0.0057 decrease in the $MGDP$ on the average in the short-run, all things been equal. It could also be revealed that 1% change in the INF will bring about a 0.000970 decrease in the $MGDP$ in the short-run.

Table 7

VEC Residual Serial Correlation LM Tests

Null Hypothesis: no serial correlation at lag order h

Sample: 1985 2018

Included observations: 32

Lags	LM-Stat	Prob
1	30.86902	0.1934
2	41.41095	0.0208

Probs. from chi-square with 25 df.

The result shows that the errors are not serially correlated. From Table 7, the p-value is greater than the chosen level of significance of 5%, indicating the absence of serial autocorrelation in the model.

Table 8

Granger Causality Tests

Pairwise Granger Causality Tests

Sample: 1985 2018

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LF does not Granger Cause LMGDP	32	1.64673	0.2114
LMGDP does not Granger Cause LF		0.13910	0.8708
LANS does not Granger Cause LMGDP	32	0.06535	0.9369
LMGDP does not Granger Cause LANS		2.45989	0.1044
INF does not Granger Cause LMGDP	32	2.24053	0.1258
LMGDP does not Granger Cause INF		1.25374	0.3015
EXC does not Granger Cause LMGDP	32	4.28685	0.0242
LMGDP does not Granger Cause EXC		5.66139	0.0088
LANS does not Granger Cause LF	32	3.98059	0.0305
LF does not Granger Cause LANS		1.38724	0.2670
INF does not Granger Cause LF	32	5.86136	0.0077
LF does not Granger Cause INF		2.30110	0.1195
EXC does not Granger Cause LF	32	0.92196	0.4099
LF does not Granger Cause EXC		0.58075	0.5663
INF does not Granger Cause LANS	32	3.28828	0.0527
LANS does not Granger Cause INF		0.56233	0.5764

EXC does not Granger Cause LANS	32	4.00041	0.0301
LANS does not Granger Cause EXC		0.07353	0.9293
EXC does not Granger Cause INF	32	3.26578	0.0537
INF does not Granger Cause EXC		0.09197	0.9124

Source: Researcher's E-view computation, 2020.

From the granger causality test in table 8, it was revealed that there is no causal relationship between LF and the MGDP, no causal relationship between ANS and MGDP, no causal relationship between INF and MGDP, however, there is a bi-directional relationship between EXC and MGDP since the P-value is less than 0.05, by implication the null hypothesis is rejected, there is no causality.

5. Conclusion and Recommendations

This study confirmed the effect of industrial sector labour force, and national income savings manufacturing sector output in Nigeria. It was discovered that the variables are cointegrated using Johanson cointegration test, hence Vector Error Correction Model was employed. The long run cointegration model shows that national savings have a long run positive effect on the manufacturing sector output, this finding is in line with the findings of Tang & Chau (2009) , that savings and economic growth are co-integrated and positively related in the long-run, likewise Lean & Song (2009), Stephen, & Obah (2017), also revealed that labour force in the industrial sector has a long-run effect on the manufacturing sector output, while inflation and exchange rate have a long-run negative effect on the manufacturing sector output. This is in agreement with the findings of Ojeyinka and Adegboye (2017). The model identified a speed of adjustment by 2% of disequilibrium correction yearly for reaching long run equilibrium steady state position. It could be deduced from this study that national savings, labour force in the industrial sector, inflation and exchange rate are very critical factors that determine the growth and survival of the manufacturing sector. Based on these empirical findings, it is therefore very important that the government look critically to the manufacturing sector and revamp the sector by making credit facility to the sector, and increase the use of domestic raw materials. The multiplier effect of this is reduction in the level of unemployment, increase per capita income and subsequently encourage savings.

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